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ARE SARCOSPORIDIA ABERRANT FORMS OF CNIDOSPORIDIA OF INVERTEBRATES?

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In the year 1910 v. Ràtz stated that Sarcosporidia are very near to the Nosematidae. In an interesting paper Darling (1915) writes: "On account of the facility with which herbivora may obtain and ingest invertebrates infected with Neosporidia, but more particularly flowers, leaves, etc., or water contaminated with droppings of bees, moth larvae, fly droppings, etc., or other material containing Neosporidia spores, is it not possible that Sarcosporidia may be side-tracked varieties of some of the Neosporidia of invertebrates which have invaded the musculature of a hospitable though by no means definitive host and, being unable to continue further their life cycle, have escaped from a compromising and aberrant position?"

This opinion of Darling was supported by the experiments of Scott (1915) who concludes his paper with the following words: "All of the evidence favors the view that the sheep is not the definite host of *S. tenella* and, therefore, is in accord with Darling's suggestion that the muscle parasites of vertebrates are aberrant forms."

In such an order of ideas it is perhaps interesting to note observations which seem to me to support the hypothesis that Sarcosporidia are identical with Cnidosporidia.

In 1896 Piana, in a paper on the life cycle of *Balbiania gigantea-S. tenella,* states that in the cultures of this parasite on sterilized moist filter paper, moist earth, gelatine prepared with *Focus crispus* at a temperature of 18 to 25 C. in twenty-five to sixty days the spores give bodies which develop more and more and present a nucleus and ameboid movements. The movements cease after some days and the amoeba assumes the form of a cyst. Piana tried to infect a sheep per os with this material, but with negative results. I may add the macroscopic examination made with a view to finding cysts of Balbiania, was confined to the esophagus.

After seventeen years I repeated (1913) the experiments of Piana with *S. muris,* making cultures of this on sterilized filter paper moistened with physiological salt solution at a temperature of 20 C. After eight days I found in this culture amoeboid bodies showing slow movement at a temperature of 20 and 37 C. This amoeba had a fine granulated protoplasm, a nucleus, and clear vacuoles. Colored with Leishman or Giemsa the protoplasm assumed an azure color, and the nucleus a red color. After thirty-two days the cultures presented only encysted forms. With this culture I inoculated a white rat and a black mouse in the muscles of the thigh but without result. The inoculation of a white rat with *S. muris* was negative, as was also the infection per os of a guinea-pig with the same *Sarcocystis.* Neither Piana nor I affirm that the amoebae were positively derived from the spores of Sarcocystis, but we stated that it was very probable; and the observation of Erdmann (1914) that in the intestinal cells of a mouse infected per os with Sarcosporidia appear little amoeboid bodies, seems to support our experiments and the fact that Sarcosporidia are identical with Cnidosporidia. This idea was also expressed by Auerbach (1910) who says: "Mit der Tatsache des vorhandenseins einer Polkapsel bei Sarcosporidiensporen fällt ein wesentlicher Unterschied gegenuber den Cnidosporidian fort und es liegt kein zwingender Grund vor, sie noch von diesen zu trennen."

If it is possible to demonstrate that spores of Sarcosporidia produce amoebae, the identity of the two orders is more probable. The drawings of the amoebae of *Myxidium inflatum, leptotheca macrospora* and *Myxidium bergense* in Auerbach (1910: 10, 79) are very likely the drawings of amoebae of *S. muris* shown in my paper.

Given the spores of the Sarcosporidial amoebae, the infection with Sarcosporidia must be analogous with the infection with Cnidosporidia. The experiments of Thélohan and particularly those of Auerbach on the development of the Cnidosporidia in the intestine of fishes prove that the spores of this parasite produces amoeboid bodies in the duodenum. It is probable that the spores of Sarcosporidia must also produce amoebae in the intestines and perhaps in Piana's experiments the amoebae were destroyed in the stomach. In fact Auerbach failed to observe a transformation of spores of Cnidosporidia in the stomach of fishes. I think it would prove an interesting experiment to make cultures from the great cysts of *S. tenella,* and to introduce the amoebae directly into the intestines of sheep. With such a method of infection it is perhaps possible to secure much more positive results than to work with spores of *Sarcosporidia* which as Auerbach states are in some cases probably not ripe.

SUMMARY

1. The observations of Piana and Galli-Valerio to the effect that spores of Sarcosporidia produce amoebic bodies in cultures, more closely relate the Sarcosporidia to the Cnidosporidia.

2. If true that Sarcosporidia are only aberrant forms of Neosporidia of invertebrates, then the hypothesis of Darling becomes more probable.

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